United Nuclear Corporation Superfund Site

Navajo Nation Environmental Protection Agency
Navajo Superfund Program
June 19-21, 2007

Presentation Overview

- Site History
- Hydrogeology
  - Mine Discharge Water Impacts
  - Post Mining Conditions
- Extent of Contamination
- Cleanup Efforts
- Current Status

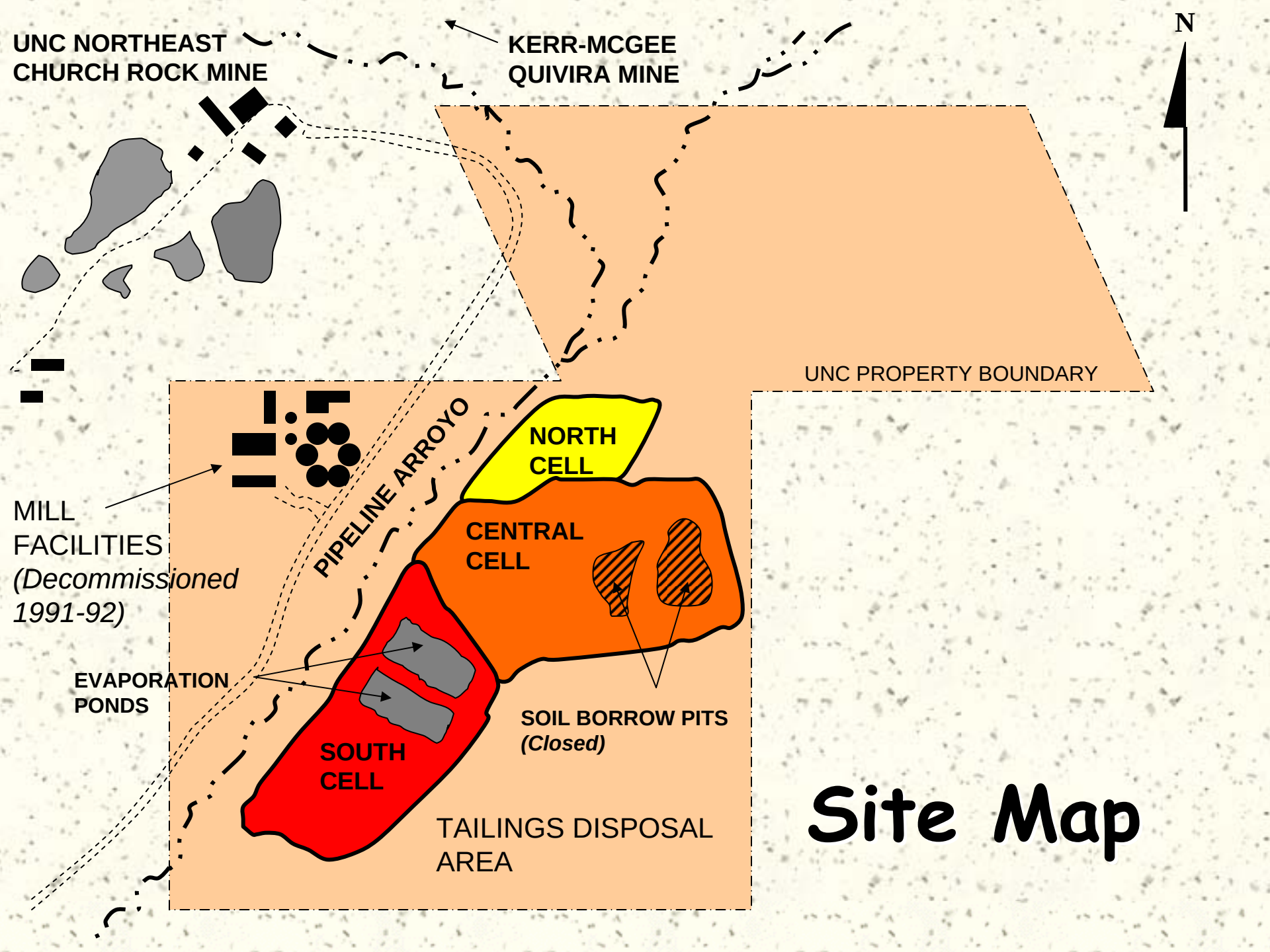
SITE LOCATION MAP

Site History

- Former uranium mill and tailings disposal area
- Mill operated from 1977-1982
- Received ore from nearby Northeast Church Rock (NECR) and Kerr-McGee mines

Site History (continued)

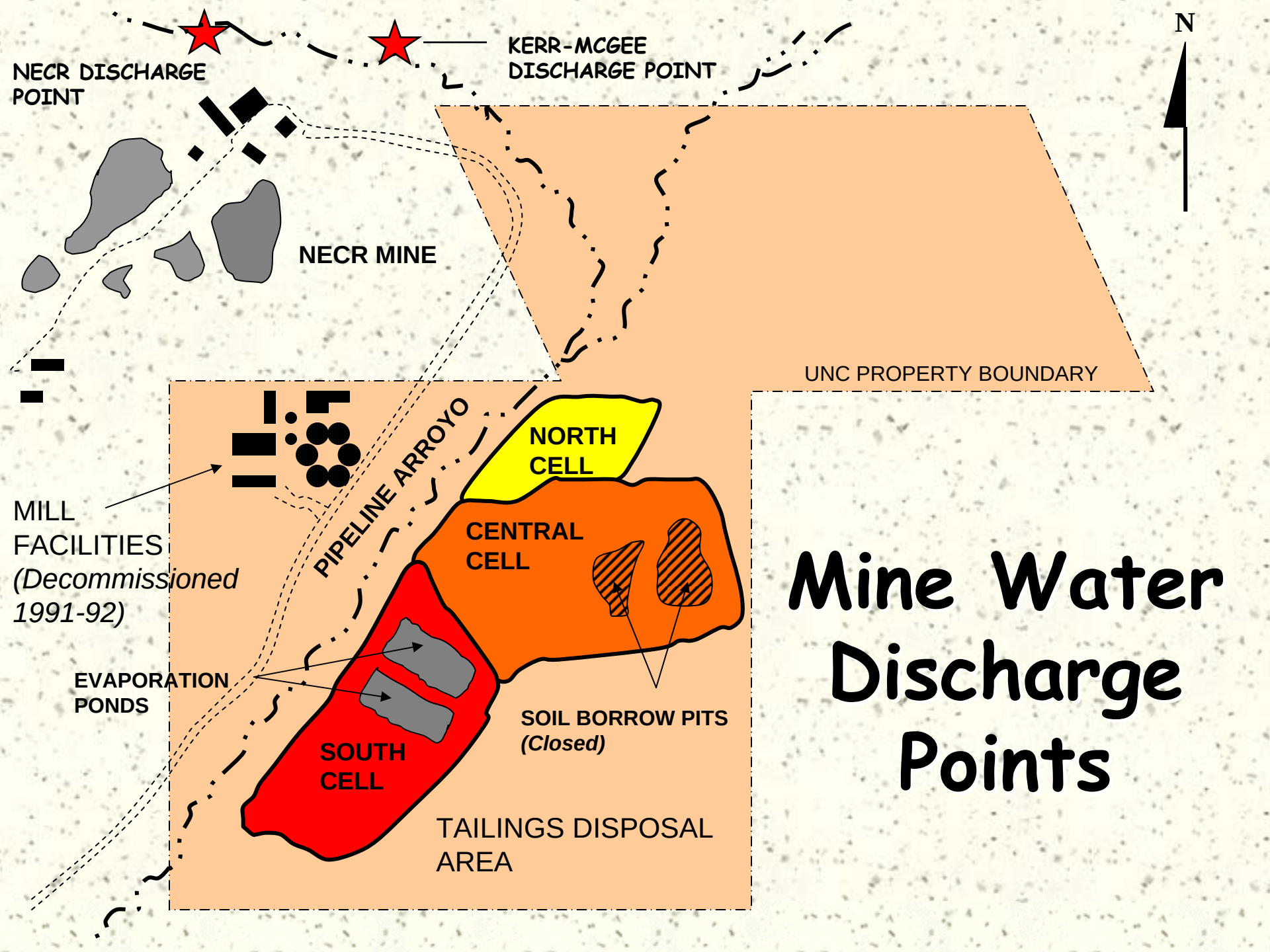
- Uranium tailings were the primary waste material and source of environmental contamination to soil, ground water and air
- Tailings contained radionuclides and metals
- 3.5 million tons of acidic tailings were disposed in three cells at site


UNC NORTHEAST
CHURCH ROCK MINE
KERR-MCGEE
QUIVIRA MINE
N
UNC PROPERTY BOUNDARY
NORTH
CELL
CENTRAL
CELL
PIPELINE ARROYO
MILL
FACILITIES
(Decommissioned
1991-92)
EVAPORATION
PONDS
SOUTH
CELL
SOIL BORROW PITS
(Closed)
TAILINGS DISPOSAL
AREA

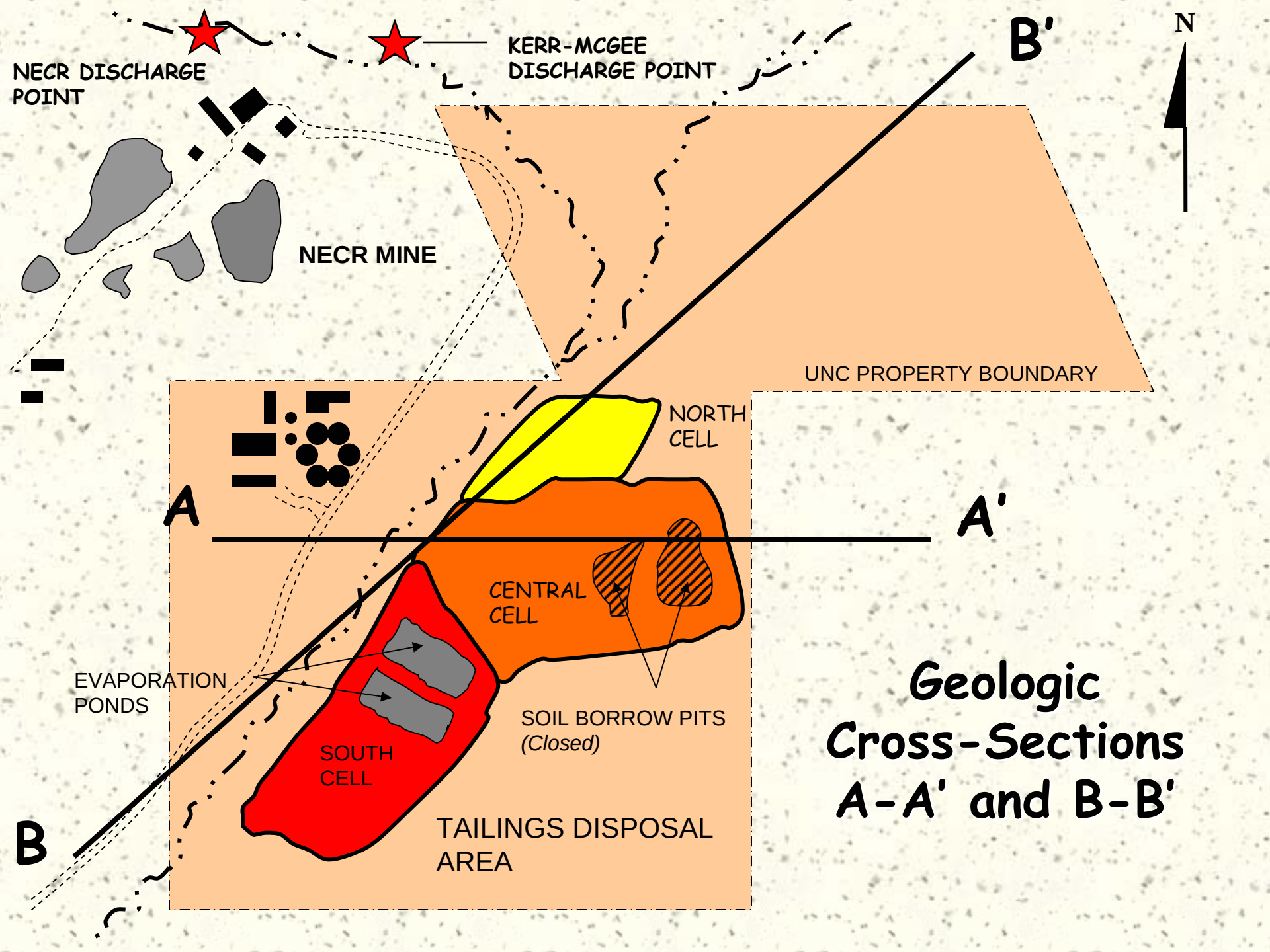
Site Map

Site Hydrogeology – Mining Impacts

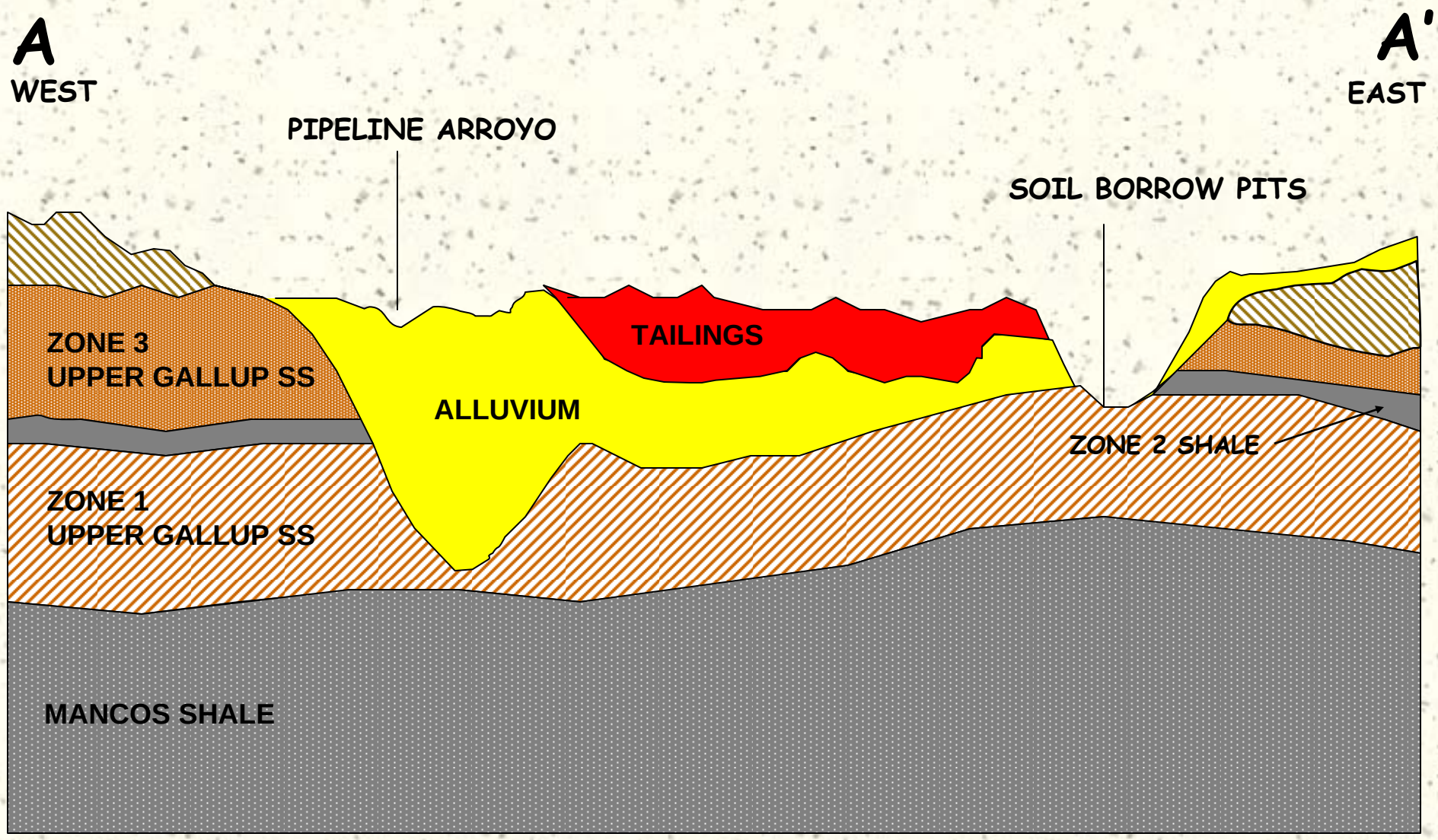
- Mine water was discharged into pipeline arroyo for 17 years (1968 – 1986)
- Discharge artificially resaturated the shallow alluvium and underlying units of the Upper Gallup Sandstone Formation
- Ground water from natural recharge was likely present in small quantities in deepest portion of alluvium (EPA, 1988)



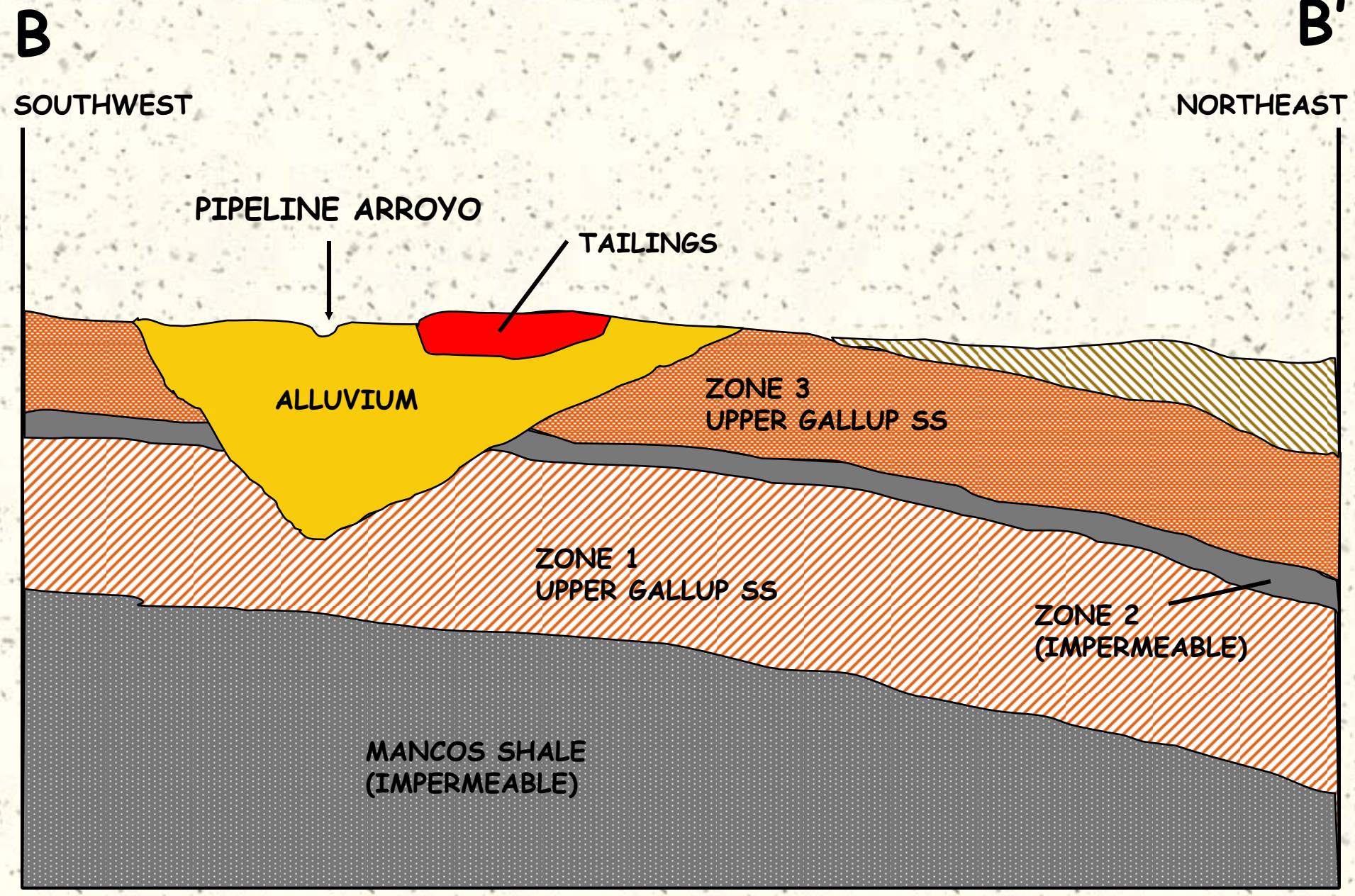
Mine Water Discharge Points

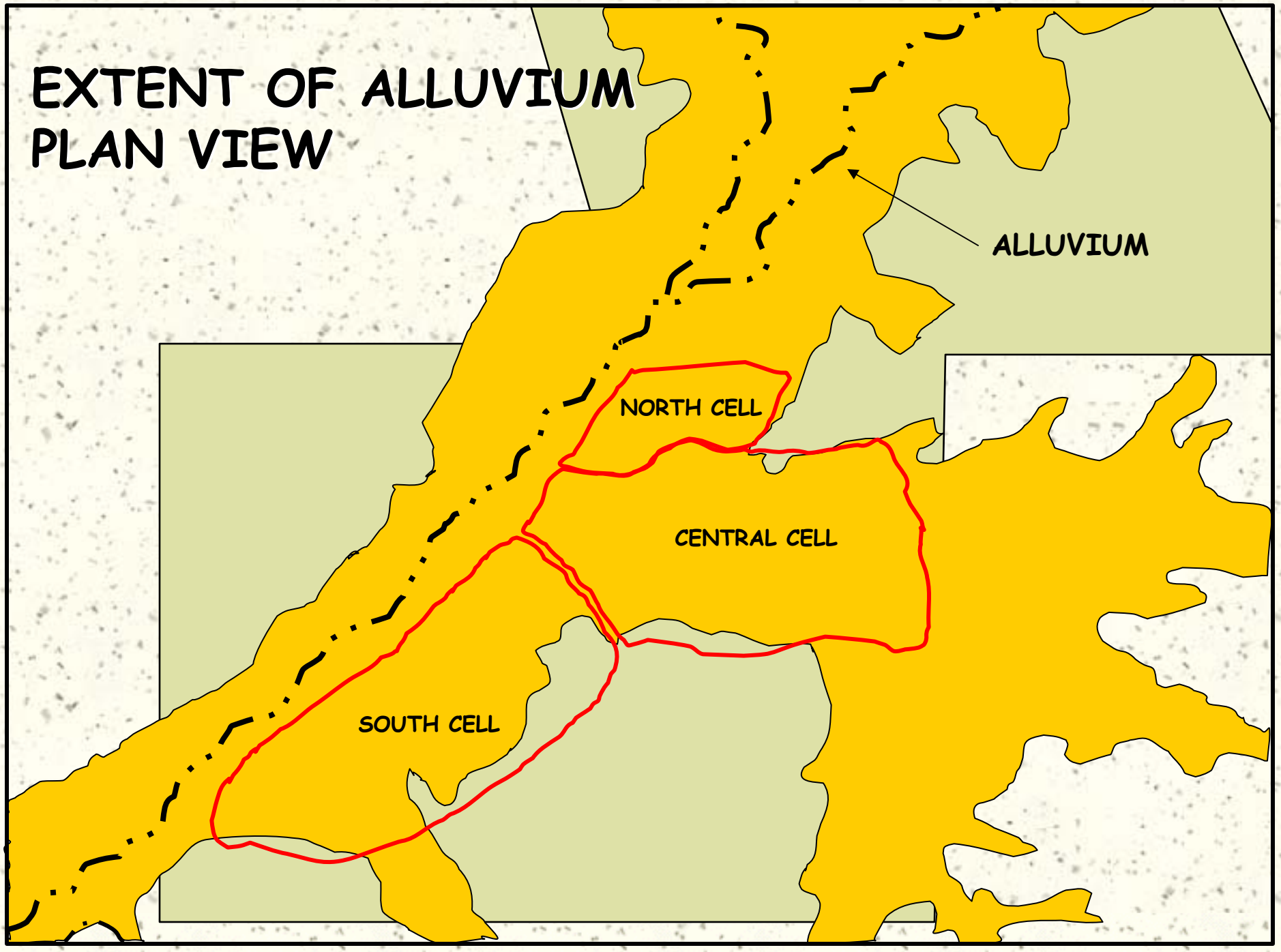

NECR DISCHARGE POINT
KERR-MCGEE DISCHARGE POINT
B'
N
NECR MINE
UNC PROPERTY BOUNDARY
NORTH CELL
A
A'
CENTRAL CELL
EVAPORATION PONDS
SOIL BORROW PITS
(Closed)
SOUTH CELL
B
TAILINGS DISPOSAL AREA
Geologic Cross-Sections A-A' and B-B'

GEOLOGIC CROSS-SECTION A-A'

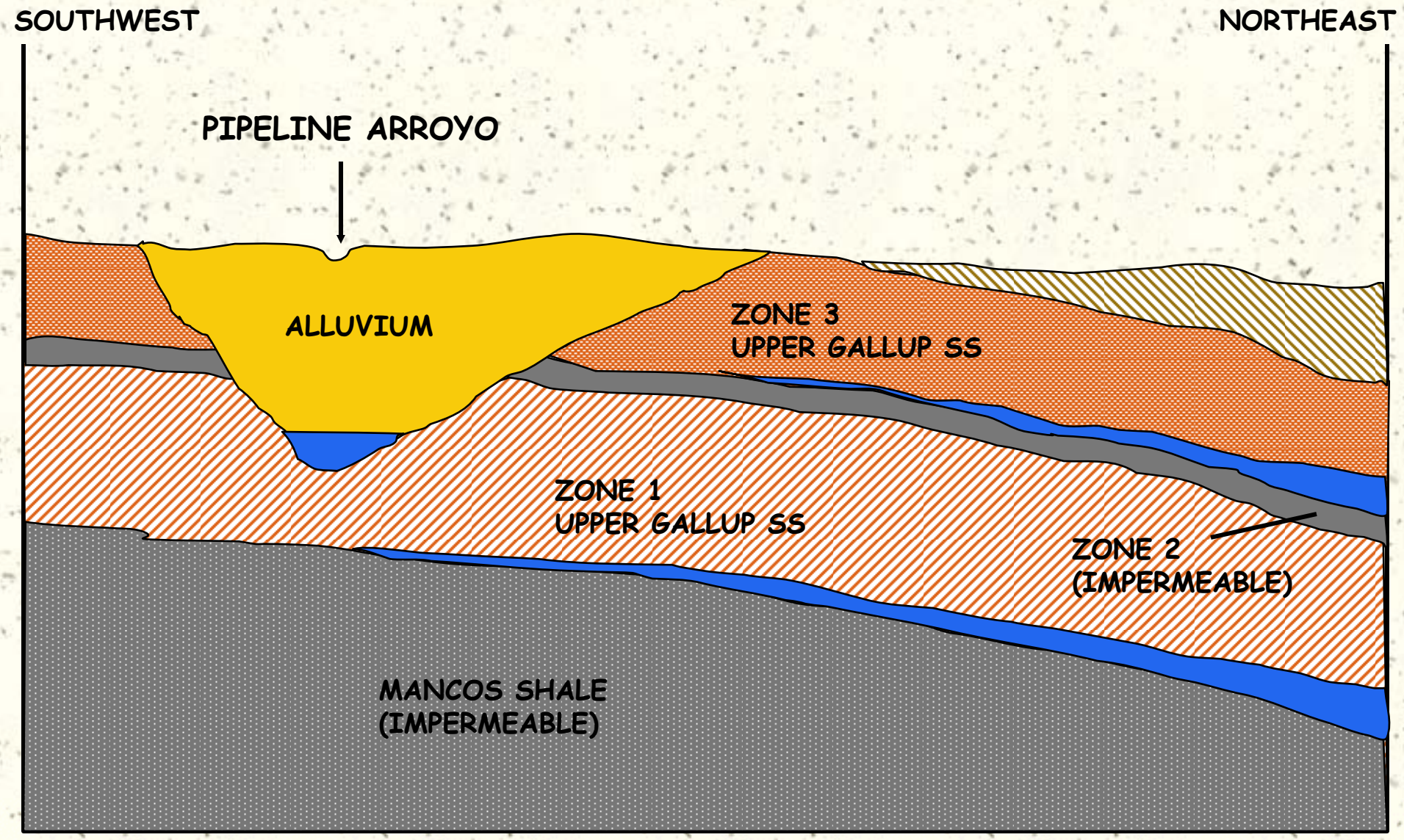


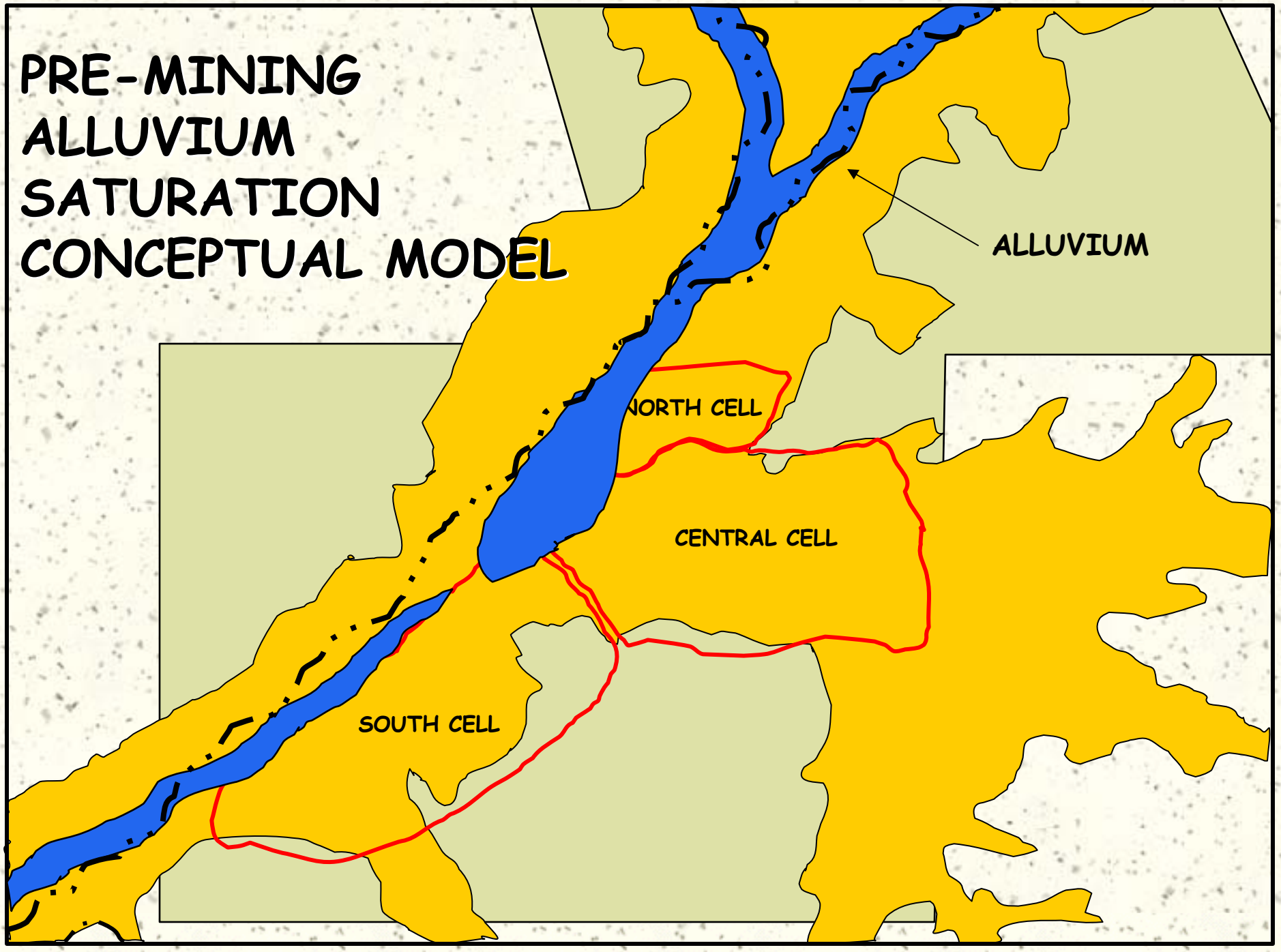
GEOLOGIC CROSS-SECTION B-B'




EXTENT OF ALLUVIUM
PLAN VIEW
ALLUVIUM
NORTH CELL
CENTRAL CELL
SOUTH CELL

PRE-MINING HYDROGEOLOGY CONCEPTUAL MODEL



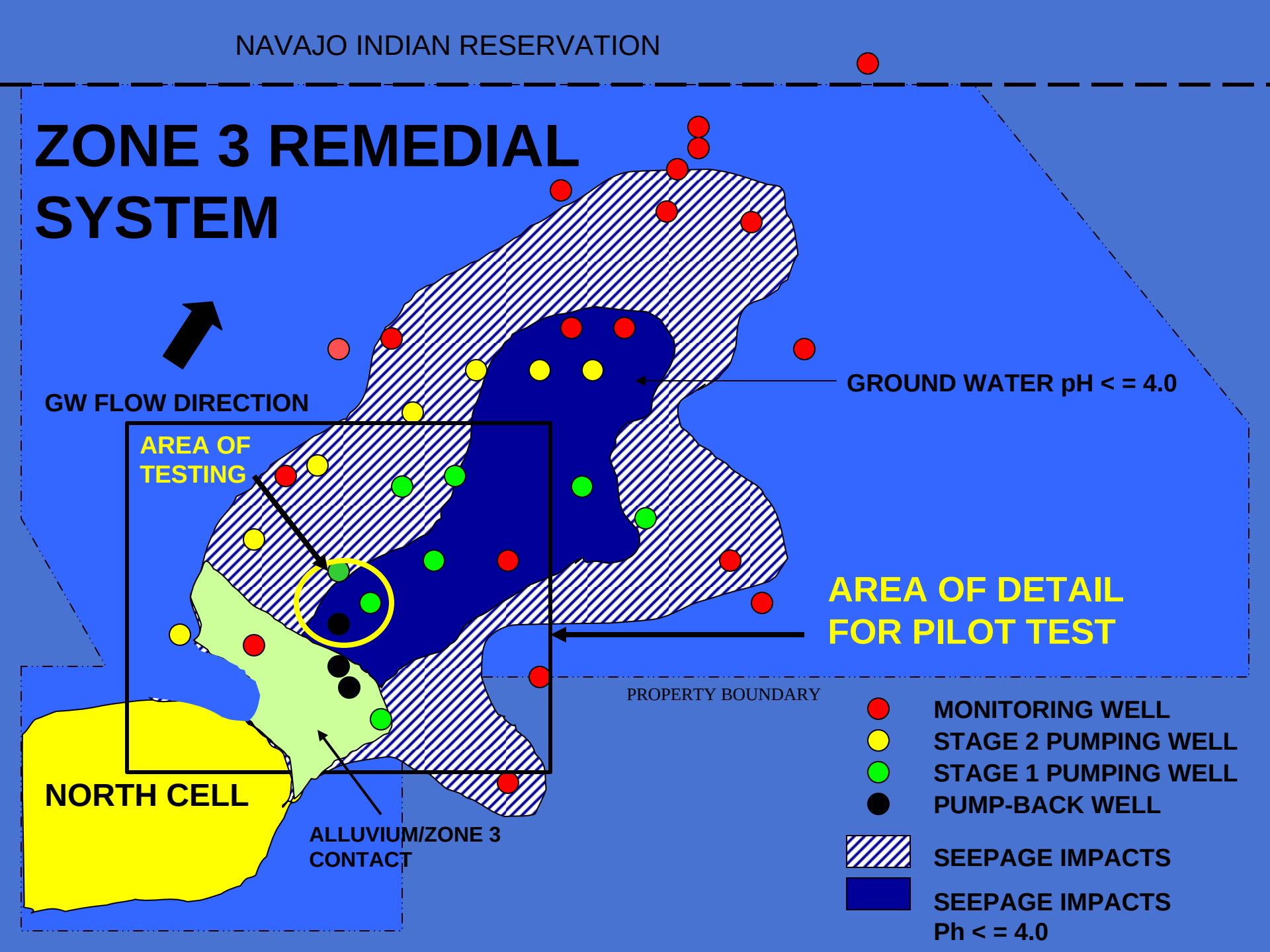

PRE-MINING
ALLUVIUM
SATURATION
CONCEPTUAL MODEL
ALLUVIUM
NORTH CELL
CENTRAL CELL
SOUTH CELL

CONDITIONS DURING MINE WATER DISCHARGE

- NECR AND QUIVIRA MINES DISCHARGED APPROX. 3,000 GPM (COMBINED AVERAGE) TO ARROYO
- APPROXIMATELY 243 GPM OF WATER FROM ARROYO INFILTRATED INTO ALLUVIUM
- DISCHARGE RAISED WATER LEVEL IN ALLUVIUM AND FLOWED INTO OTHER POROUS UNITS

ZONE 3 REMEDIAL EFFORTS

- WATER INJECTION PILOT STUDY
  - INJECT CLEANER, LESS ACIDIC, GROUND WATER FROM DEEPER AQUIFER (WESTWATER CANYON) INTO A SMALL AREA OF ZONE 3
  - DECREASE ACIDITY OF ZONE 3 WATER AND PRECIPITATE OUT CONTAMINANTS
  - PLANNED START-UP SEPTEMBER 2006


NAVAJO INDIAN RESERVATION
ZONE 3 REMEDIAL SYSTEM
GW FLOW DIRECTION
AREA OF TESTING
GROUND WATER pH < = 4.0
AREA OF DETAIL FOR PILOT TEST
PROPERTY BOUNDARY
NORTH CELL
ALLUVIUM/ZONE 3 CONTACT
MONITORING WELL
STAGE 2 PUMPING WELL
STAGE 1 PUMPING WELL
PUMP-BACK WELL
SEEPAGE IMPACTS
SEEPAGE IMPACTS Ph < = 4.0

TECHNICAL IMPRACTICABILITY EVALUATION

- UNC CONDUCTED TI EVALUATION AND RECOMMENDED WAIVER FOR TDS, SULFATE AND MANGANESE
- EPA REGIONAL-LED TEAM TO REVIEW TI EVALUATION

TI WAIVER REVIEW TEAM

- MARK PURCELL, EPA-REGION 6
- JAMES TURNER, EPA-REGION 6
- ED BATES, EPA-ORD
- DAVE REISMAN, EPA-ORD
- TERRY BURTON, EPA -ORD REGIONAL LIAISON
- JONATHAN HOOK, EPA TRIBAL AFFAIRS
- **DIANA MALONE, NNEPA ***
- **EARL DIXON, NNDWR ***
- **DAVID TAYLOR, NNEPA COUNSEL ***
- ROGER LEE, USGS
- PAUL MICHALAK, NRC
- JERRY SCHOEPPNER, NMED

SUPPLEMENTAL FEASIBILITY STUDY (SFS)

- EPA HAS DIRECTED UNC TO PERFORM A SITE-WIDE SFS
- TO EVALUATE OTHER REMEDIAL ALTERNATIVES AND SUPPORT FUTURE EPA DECISION-MAKING ON REMEDY CHANGE
- PRELIMINARY SCREENING OF ALTERNATIVES – SEPTEMBER 2006
- DRAFT SFS – NOVEMBER 30, 2006

SUPPLEMENTAL FEASIBILITY STUDY

- ALTERNATIVES TO BE ASSESSED INCLUDE:
  - NO FURTHER ACTION
  - HYDRAULIC CONTAINMENT BY EXTRACTION/EVAPORATION (SIMILAR TO CURRENT REMEDY)
  - EXTRACTION WITH HORIZONTALLY DRILLED WELLS
  - WATER INJECTION WITH EXTRACTION/EVAPORATION
  - INSTITUTIONAL CONTROLS *

FUTURE EPA DECISION-MAKING

- FOLLOWING COMPLETION OF SITE-WIDE SFS, EPA PLANS TO CHANGE THE REMEDY
  - EXPLANATION OF SIGNIFICANT DIFFERENCE (ESD), OR
  - ROD AMENDMENT

PROJECT SCHEDULE

- ACTIVITIES TO BE COMPLETED:
  - ZONE 3 HYDRAULIC FRACTURING FINAL REPORT AND PROPOSED ACTIONS – COMPLETED - FALL, 2006
  - TI WAIVER EVALUATION – SPRING, 2007
  - SITE-WIDE SFS - SPRING 2007
  - WATER INJECTION PILOT – SPRING 2007
  - ROD AMENDMENT OR ESD FALL 2007

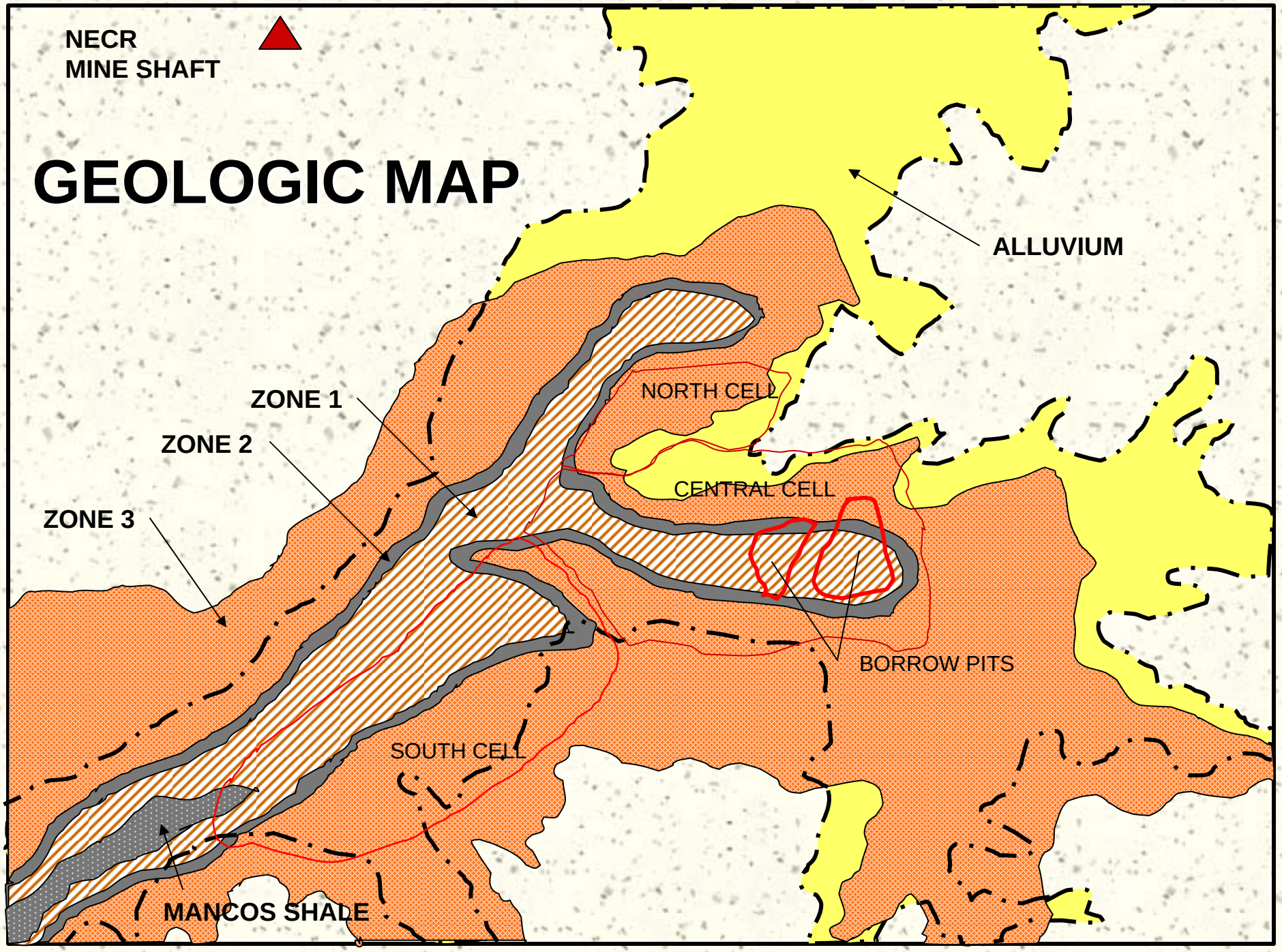
ISSUES

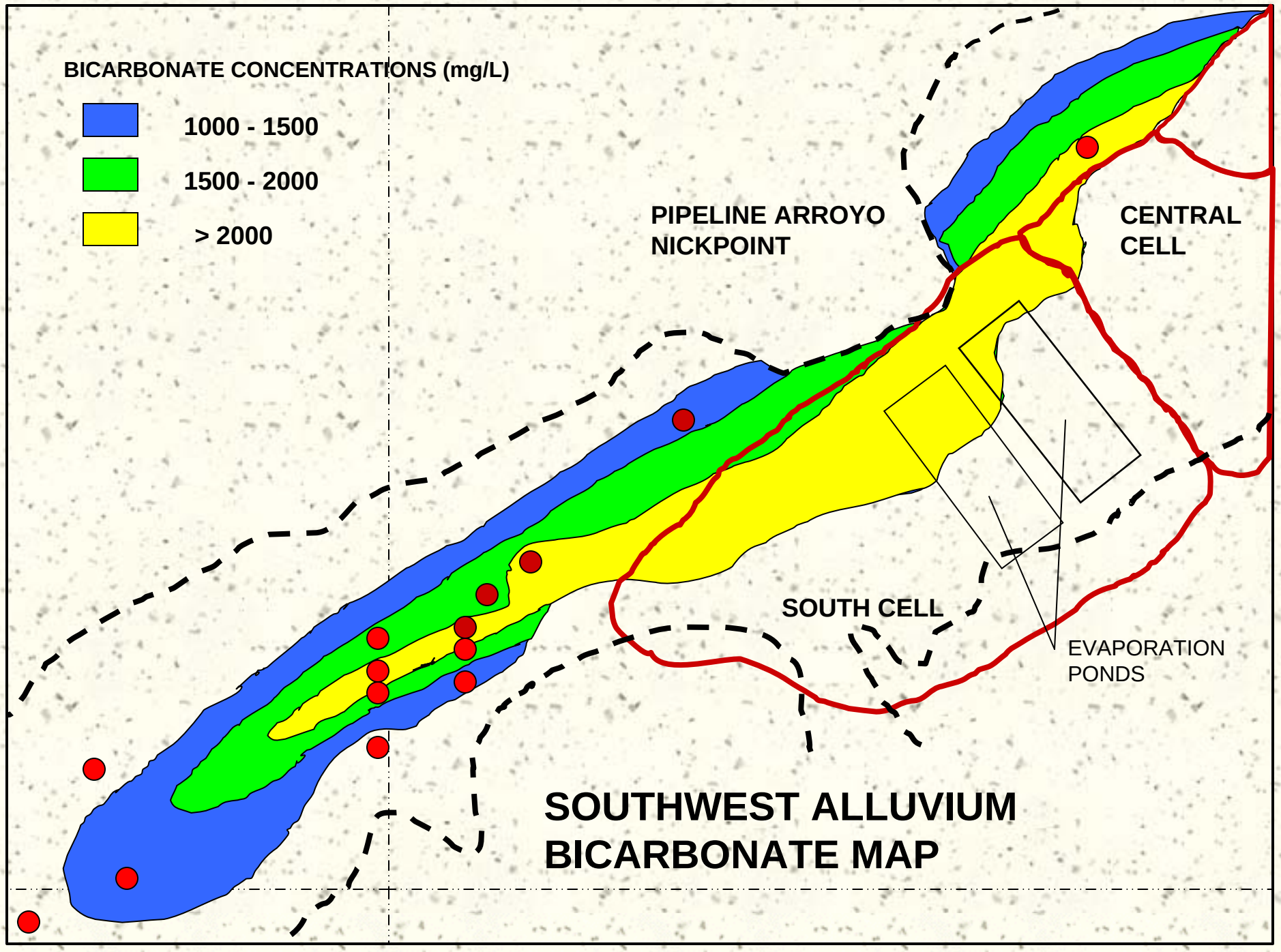
IF EPA FINDS IT TECHNICALLY IMPRACTICABLE TO ACHIEVE CLEANUP LEVELS FOR SULFATE, AND TDS IN OFF-SITE GROUND WATER, WHAT ARE OPTIONS FOR PREVENTING EXPOSURE?

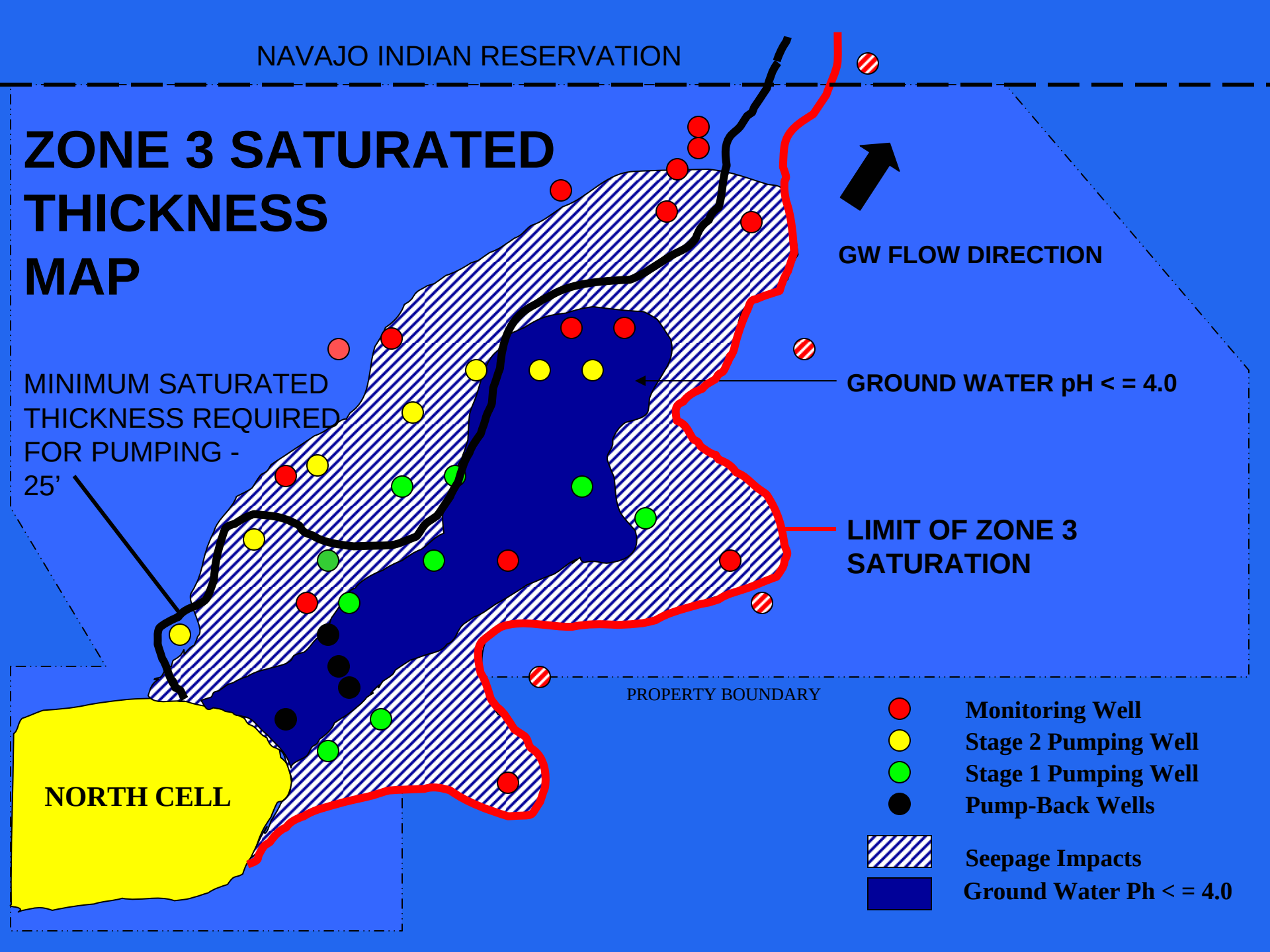
INSTITUTIONAL CONTROLS?

PURPOSE OF TODAY'S MEETING

CONTINUE DISCUSSIONS ON THE FEASIBILITY OF ESTABLISHING ICs AT CHURCH ROCK FOR PREVENTING EXPOSURE TO POOR QUALITY GROUND WATER


NECR
MINE SHAFT
GEOLOGIC MAP
ALLUVIUM
ZONE 1
ZONE 2
ZONE 3
NORTH CELL
CENTRAL CELL
BORROW PITS
SOUTH CELL
MANCOS SHALE


BICARBONATE CONCENTRATIONS (mg/L)
1000 - 1500
1500 - 2000
> 2000
PIPELINE ARROYO
NICKPOINT
CENTRAL
CELL
SOUTH CELL
EVAPORATION
PONDS
SOUTHWEST ALLUVIUM
BICARBONATE MAP


NAVAJO INDIAN RESERVATION
ZONE 3 SATURATED THICKNESS MAP
GW FLOW DIRECTION
MINIMUM SATURATED THICKNESS REQUIRED FOR PUMPING - 25'
GROUND WATER pH < = 4.0
LIMIT OF ZONE 3 SATURATION
PROPERTY BOUNDARY
NORTH CELL
Monitoring Well
Stage 2 Pumping Well
Stage 1 Pumping Well
Pump-Back Wells
Seepage Impacts
Ground Water Ph < = 4.0